



**Testimony
Before the Committee on Energy and
Commerce
Subcommittee on Oversight and Investigations
United States House of Representatives**

**CDC's Role in Monitoring and Preventing
Healthcare-Associated Infections**

Statement of

Denise Cardo, M.D.

Director, Division of Healthcare Quality Promotion

National Center for Infectious Diseases

Centers for Disease Control and Prevention

U.S. Department of Health and Human Services



**For Release on Delivery
Expected at 2:00 p.m.
Wednesday March 29, 2006**

Good afternoon Mr. Chairman and Members of the Subcommittee. I am Dr. Denise Cardo, Director of the Division of Healthcare Quality Promotion of the National Center for Infectious Diseases, Centers for Disease Control and Prevention (CDC). I am pleased to be here today to describe the activities CDC has undertaken in monitoring and preventing healthcare-associated infections. CDC provides leadership in surveillance, outbreak investigations, laboratory research, and prevention of healthcare-associated infections. Knowledge gained through these activities is used by CDC to 1) assess the magnitude, trends, and risk factors of healthcare-associated infections; 2) detect new patterns and mechanisms of antimicrobial resistance; 3) detect infections and adverse events related to new procedures performed in healthcare; and 4) develop new strategies to prevent healthcare-associated infections.

Healthcare-associated Infections: The Hidden Harm of Healthcare

As the nation's health protection agency, CDC is committed to helping all Americans receive the best and safest care when they are treated at a hospital or other healthcare facility. CDC has defined twenty-one specific health protection goals to prioritize and focus its work and investments and measure progress. Our Division has been designated as the lead for the goals to increase the number of healthcare settings that provide safe, effective, and satisfying patient care. Healthcare-associated infections are infections that patients acquire during the course of receiving medical treatment for other conditions; these infections are a threat to patient safety. An increasing public awareness of this serious problem

has led to a call for public disclosure of healthcare infection rates in the United States through mandatory reporting of information related to healthcare-associated infections.

Healthcare-associated infections in the hospital are among the most common adverse events in healthcare. CDC estimates there are approximately 1.7 million healthcare-associated infections in U.S. hospitals and 99,000 associated deaths each year. There are approximately 4.5 infections per 100 hospital admissions, 9.3 infections per 1000 patient days in Intensive Care Units (ICUs), and 2 surgical site infections per 100 operations. These estimates are based on best available data, but some infections are known to be underreported, so the actual number of healthcare-associated infections may be higher.

Estimates of the economic impact of healthcare-associated infections vary because of differences in how the data are defined and analyzed. Data from published studies indicate the estimated cost of healthcare-associated infection, adjusted to 2004 dollars, ranges from \$10,500 per case for bloodstream, urinary tract, and pneumonia infections to \$111,000 per case for antibiotic-resistant bloodstream infection in transplant patients.

Who is at Risk for Healthcare-associated Infections?

Healthcare-associated infections are defined as infections affecting patients who receive either medical or surgical treatments. The procedures and devices used

to treat patients can also place them at increased risk for healthcare-associated infections. A patient's skin, the natural protection against bacteria entering the blood, is continually compromised by the insertion of needles and tubes to deliver life saving medicine. Microbial pathogens can be transmitted through tubes and devices that are going into patients, providing a pathway into the blood stream and lungs. Because of the number of procedures and the seriousness of patient conditions, patients treated in the ICU have the highest risk of healthcare-associated infections.

The frequency of healthcare-associated infections varies by body site. In the United States from 1990-2004, the most frequent healthcare-associated infections reported to the National Nosocomial Infections Surveillance (NNIS) system, overall, were urinary tract infections (34%), followed by surgical site infections (17%), bloodstream infections (14%), and pneumonia (13%).

Bacterial Species Causing Healthcare-associated Infections

To understand the problem of healthcare-associated infections, it is vitally important to recognize the intertwined problem of antimicrobial resistance. Infections that are acquired in hospitals and other healthcare settings are frequently caused by bacteria that have become resistant to multiple antimicrobial drugs. These organisms have gained resistance while remaining highly infectious and are easily spread in healthcare settings. Efforts to prevent healthcare-associated infections must therefore be strategically interwoven into efforts that address increasing antimicrobial resistance.

Resistant infections contribute substantially to healthcare costs, illness, and death. Although a number of different bacteria can cause these infections, there are a few that cause the majority of diseases. Of particular concern is the bacteria known as methicillin-resistant *Staphylococcus aureus* or MRSA. MRSA was first recognized as a cause of healthcare-associated infections in the 1960's and has become commonplace in many hospitals in the United States.

According to CDC surveillance, MRSA was the cause of 29% of *Staphylococcus aureus* infections acquired by patients in intensive care units in 1991. By 2003, that number had increased to 60%. The number of MRSA infections among hospitalized patients in the United States has been estimated to be at least 126,000 per year. Because of the tremendous impact of MRSA and other resistant bacteria as causes of healthcare-associated infections, an integrated approach to detection, control, and prevention is required and is being recommended by CDC.

Investigation and Response

Bacteria and other microbial pathogens causing healthcare-associated infections are constantly changing. As new antibiotics are released, the organisms find ways to develop resistance. As new devices are used in hospitals, the organisms find new or unexpected ways to infect patients. The dynamic nature of healthcare-associated infections requires a vigilant eye for detecting and responding to these emerging threats.

CDC serves as a national leader for investigating outbreaks of healthcare-associated infections along with state and local health departments. Discussions or calls from concerned clinicians and infection control professionals often prompt further investigation. During investigations involving contaminated medical devices or medication, CDC works with the Food and Drug Administration to recall contaminated devices and medicines if necessary to prevent further infections and save patients' lives. For some outbreaks, CDC sends its own epidemiologists, physicians, and scientists to hospitals to interview patients and staff, to review medical records and to test for microbial contamination of devices or of the environment. During investigations, CDC staff interview and gather information from patients and family members. Information from these investigations have a direct impact on controlling and preventing healthcare-associated infections at these facilities, but also directly lead to improvements in national infection control guidelines and in development of definitions used for public reporting in those states mandating it. For example, CDC epidemic intelligence service officers were recently deployed to North Carolina to investigate increases in reports of cases caused by *Clostridium difficile*, a bacterium that causes over 200,000 cases of healthcare-associated diarrheal disease each year. Interviews with patients and family members are leading to a better understanding of the characteristics of the illness and the source of infection. In addition to prevention of infections, this information is being used to make practical definitions available for use in public reporting for

states that are considering making *Clostridium difficile* infection reportable as was recently done in Ohio.

Prevention

CDC leads and supports a range of infection prevention activities at the national, regional and local levels. CDC's healthcare-associated infection prevention activities include developing evidence-based practice guidelines, assessing institution- and provider-level barriers and best practices for adoption of effective practices, developing and disseminating educational materials and toolkits to assist in translating policy into practice, and identifying and evaluating novel prevention strategies.

CDC guidelines serve as the standard of care in U.S. hospitals and guide the clinical practices of physicians, nurses and other providers. However, full adherence to these recommendations in clinical practice remains a challenge. For example, CDC developed and disseminated evidence-based guidelines to prevent surgical site infections. Subsequent assessment of adoption of these practices among U.S. surgeons has shown that adherence to these recommendations needs to be improved. CDC has successfully partnered with the Centers for Medicare and Medicaid Services (CMS), surgical societies, and other stakeholders to design and launch a national initiative for prevention of surgical site infections. In addition, CDC guidelines have served as the basis for national healthcare quality initiatives such as the Institute for Healthcare

Improvement's 100,000 Lives Campaign, and the Surgical Care Improvement Project. These collaborations help to standardize clinical practice, translate policy into practice, and reduce healthcare-associated infections.

Monitoring Infections

Through voluntary reporting from a national network of sentinel hospitals, CDC has monitored healthcare-associated infections since 1970 using the surveillance methods of the NNIS system. With these data, CDC has provided hospitals nationwide with infection rates that they use to track their progress in prevention and control efforts.

More than just a reporting mechanism, NNIS has set standards that have been used by hospitals and healthcare researchers internationally to measure healthcare-associated infections and to document progress with adherence to infection control practices. Standard definitions for surveillance and standard approaches to data collection and analysis have allowed clinicians and hospital staff to gauge how well they are preventing infectious disease outcomes such as bloodstream infections, pneumonias, urinary tract infections, and surgical site infections. Because hospitals may have very different kinds of patients, rates of healthcare-associated infections can be calculated to account for differences in severity of illness or in the complexity of procedures performed. The use of these "risk-adjusted rates" allows facilities to more accurately compare their own

progress in infection prevention and control to other facilities as well as to their own rates in the past.

The purpose of surveillance is not simply to count and characterize healthcare-associated infections, but most importantly to control and prevent them. The data are only as good as our ability to improve the quality of healthcare and to minimize and eliminate infections. For this reason, CDC built into NNIS, and now into the recently launched web-based surveillance system called the National Healthcare Safety Network (NHSN), the ability for facilities to analyze their own infection data and to tailor their activities to meet their greatest needs. This feedback, coupled with quality improvement initiatives to increase adherence to CDC infection control practice standards, can reduce healthcare-associated infections.

National Data for Local Action

The systematic collection and analysis of data on healthcare-associated infections yields critical information that can improve infection prevention and control. Hospitals that participated in the NNIS system have been successful in reducing rates of specific infection types across the spectrum of healthcare-associated infections.

During 1990-2004, rates of infections from medical devices decreased for three main body sites: the respiratory tract, urinary tract, and bloodstream, which are all monitored in ICUs. Bloodstream infections from tubes or catheters used to

monitor patients or deliver medicine directly into major blood vessels (central lines) decreased substantially over the 14-year period. They decreased by 54% in medical ICUs, by 43% in coronary ICUs, 43% in surgical ICUs, and 27% in pediatric ICUs. For urinary catheter-associated infections, similar decreases among these same four ICU types ranged from 43% to 61%. Trends of ventilator-associated pneumonia rates were assessed through 2001 and substantially decreased from 31% to 58% among these same ICU types. These data are derived from CDC's NNIS and NHSN systems, which have proved to be instrumental in initiating change by effectively providing hospitals feedback about their own infection rates resulting in these significant decreases.

One example of how the system has led to improvement in healthcare-associated infection rates comes from a hospital in New York. Linda Greene is an Infection Control Professional whose 500-bed hospital in New York has participated in the NNIS system since 1995. She states, "We have made significant improvements in several areas as a result of being able to utilize infection data which is reliable, valid, and risk adjusted. We are then able to turn this data into information which allows care providers to improve both the outcomes of care as well as those processes most closely associated with these outcomes." She reports that one specific project resulted in a 75% reduction in central line-associated bloodstream infections over 2 years resulting in a drop in attributable mortality to zero and preventing more than one million dollars in costs. Their reduction has been statistically significant and sustainable.

At the core of efforts to share prevention solutions is the use of healthcare-associated infection data as a common measurement and feedback tool. Using a standardized form of measuring healthcare-associated infections, such as the kind NNIS and NHSN provide, allows hospitals to communicate with one another about the impact of their prevention efforts in a meaningful and credible way and spread the word about prevention strategies that work.

Regional Data for Local Action

The Pittsburgh Regional Healthcare Initiative includes approximately 40 healthcare facilities in the Pittsburgh area with the goal of eliminating preventable healthcare-associated infections. Working closely with our prevention partners in southwestern Pennsylvania and elsewhere, CDC is using NHSN to collect data in standardized ways and collect process measures (e.g., selected practices used during central line insertion, such as correctly preparing the skin) and outcome measures (e.g., selected healthcare-associated infections such as central line-associated bloodstream infections) in the participating hospitals in the Pittsburgh area. These data and the successful prevention methods are shared with clinicians and hospitals. Our work there suggests that hospitals are eager for this type of productive sharing of regional information. For example, a bloodstream infection prevention initiative involved over 70% of the eligible hospitals in Pittsburgh metropolitan statistical area, and included a wide range of facilities

from the very smallest community hospitals to the very largest tertiary care facilities.

This CDC-supported collaboration in Pennsylvania resulted in a 68% reduction in the rate of central line-associated bloodstream infections during the period April 2001--March 2005, a reduction that is estimated to result in at least 40 lives saved every year among the group of intensive care units that participated.

Strategies perceived as important to this success include the involvement of leadership; feedback of unit-, facility-, and region-specific rates of healthcare-associated infections using the NHSN system; measurement and feedback of adherence to recommended practices; and real-time response to infections.

These experiences with Pittsburgh Regional Healthcare Initiative highlight the importance of regional data for local action to prevent healthcare-associated infections and underscore the confidence participants had in NNIS standards that allowed fair comparisons among facilities. We need standard definitions and data collection tools in order to compare, share, and improve practices.

Standardized process and outcome measures for national healthcare performance for hospitals, nursing homes, and other settings have been endorsed by several agencies and organizations, including other U.S. federal agencies and other organizations such as the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

Public Reporting of Healthcare-associated Infections

An increasing public awareness of the serious problem of healthcare-associated infections and the uses of data collection have led to a call for public disclosure of healthcare infection rates in the United States. Since 2002, seven states have enacted legislation mandating hospitals and other healthcare organizations to report healthcare-associated infection rates. These states are Florida, Illinois, Missouri, Nevada, New York, Pennsylvania, and Virginia. All but Nevada include a provision for public disclosure. In addition, 22 states have 2006 legislative activity underway and six states have bills requiring further study on the issue.

CDC believes that information about healthcare-associated infections can lead to an increased focus on infection control and prevention. In addition, CDC experience has shown that sharing information for local action can improve patient safety. CDC believes that educating clinicians, decision makers, and the public about the prevention of healthcare-associated infections is an important benefit of the dialogue created by the healthcare-associated infection public reporting movement.

In order to better guide the states considering legislation for mandatory reporting of healthcare-associated infection information, CDC partnered with the Healthcare Infection Control Practices Advisory Committee, the Council for State and Territorial Epidemiologists, the Association for Professionals in Infection Control and Epidemiology (APIC), and the Society for Healthcare Epidemiology

of America (SHEA) to develop guidance for public reporting of healthcare-associated infections.

These recommendations include 1) to use established public health surveillance methods when designing and implementing mandatory healthcare-associated infection reporting systems; 2) to create multidisciplinary advisory panels, including persons with expertise in the prevention and control of healthcare-associated infections, to monitor the planning and oversight of public reporting systems for healthcare-associated infection; 3) to choose appropriate process and outcome measures based on facility type and phase-in measures to allow time for facilities to adapt and to permit ongoing evaluation of data validity; and 4) to provide regular and confidential feedback of performance data to healthcare providers. As more research and experience becomes available, the recommendations will be updated.

CDC's experience with Pittsburgh Regional Healthcare Initiative and other groups indicates that monitoring healthcare-associated infections through both process measures and outcome measures is desirable. When deciding what should be recommended, the Healthcare Infection Control Practices Advisory Committee and partners considered infections with simple definitions and existing measurement recommendations by CDC, JCAHO and CMS.

Over time, any standard will need to be revised when new scientific information becomes available and as medical practice evolves. It is clear from CDC's experience that a reporting system will produce quality data when the infrastructure includes trained infection control personnel, maintenance of manual and automated data collection systems and databases, analysis and interpretation of findings, creation of evidence-based recommendations, and feedback to healthcare professionals to effect change in practices.

CDC supports national standards as a key to consistency in case finding, data collection, trend analysis, risk adjustment, and comparisons across surveillance sites and jurisdictions. As the science of risk adjustment advances, CDC will lead the effort to incorporate these advances into the system in order to respond better to future national and state needs or requests. CDC also supports use of electronic data for surveillance as a way to streamline case detection and reporting, provided the electronic data are sufficiently detailed and reliable for those purposes. The design of NHSN will accommodate transmission of data in electronic form from hospital systems to CDC. As electronic health record systems are more widely adopted, NHSN is well positioned to accept electronic data that originate in clinical care.

It has been recognized that with the benefits that public reporting may bring, there is also the potential for unintended consequences. Mandatory public reporting that does not incorporate sound surveillance principles and reasonable

goals may divert resources to reporting infections and collecting data for risk adjustment and away from patient care and prevention. Such reporting also could result in unintended disincentives to treat patients at higher risk for healthcare-associated infection. Lastly, publicly reported healthcare-associated infection rates can mislead stakeholders if inaccurate information is disseminated. Therefore, in a mandatory public report of healthcare-associated infection information, the limitations of current methods should be clearly communicated within the publicly released report. Research and evaluation of existing and future healthcare-associated infection reporting systems is needed to answer questions about 1) the comparative effectiveness and efficiency of public reporting systems and 2) the occurrence and prevention of unintended consequences. Ongoing evaluation of public reporting will be needed to confirm the appropriateness of the methods used and the validity of the results.

Building on NNIS Success – NHSN

To enhance the potential for public reporting, enable even more healthcare facilities to participate in a national surveillance system, and use recent advances in information technology, CDC launched the NHSN in 2005. NHSN is a secure, Internet-based system that builds on the working relationships and surveillance standards established in NNIS. The system is built using standard approaches for information exchange consistent with the HHS National Health Information Technology Initiative. Through NHSN, participating hospitals can report to CDC and can join a group (e.g., a state reporting agency or healthcare system)

allowing the agency or healthcare system to see their data. Additionally, the data can be entered once but can be used for multiple purposes, both for guiding prevention programs in the hospital and for public reporting. This removes parallel, redundant data entry. As a result of CDC's discussions with states about NHSN, technical enhancements are planned to better support public reporting. CDC is expanding its training and user support for NHSN and is adding information technology capacity to handle the anticipated increase in system use.

Virginia now requires the use of NHSN and Missouri recommends that NHSN be used for purposes of public reporting. Other states, including New York, are considering the use of NHSN. CDC is working with various state colleagues regarding the option of using NHSN to meet their needs and to define the roles and responsibilities of CDC and state agencies if NHSN is selected for use. Wide adoption and adherence to nationally standardized infection criteria, data collection protocols, and statistical methods enables NHSN to be used more effectively for public reporting across states. The ability to compare data produced through a standards-based approach will increase the value of healthcare-associated infection reporting for the public, policy makers, and practitioners.

Conclusion

Healthcare-associated infections are a threat to patient safety. While many organizations are working hard to prevent infections and fight antimicrobial

resistance in U.S. healthcare settings, this issue continues to be a challenge. These problems are larger than any one institution or agency can solve alone. Individuals at the federal, state, and local levels, in the public and private sector, need to work together to improve strategies to meet this healthcare challenge. The information derived from public reporting of healthcare-associated infections can be a catalyst for increased adherence to recommendations, while steering public and private efforts to develop new strategies to prevent healthcare-associated infections. CDC is strategically positioned to continue to provide leadership in this area.

Thank you very much for your attention. I will be happy to answer any questions you may have.